Geology and Mineral Deposits of Nova Scotia

Nova Scotia

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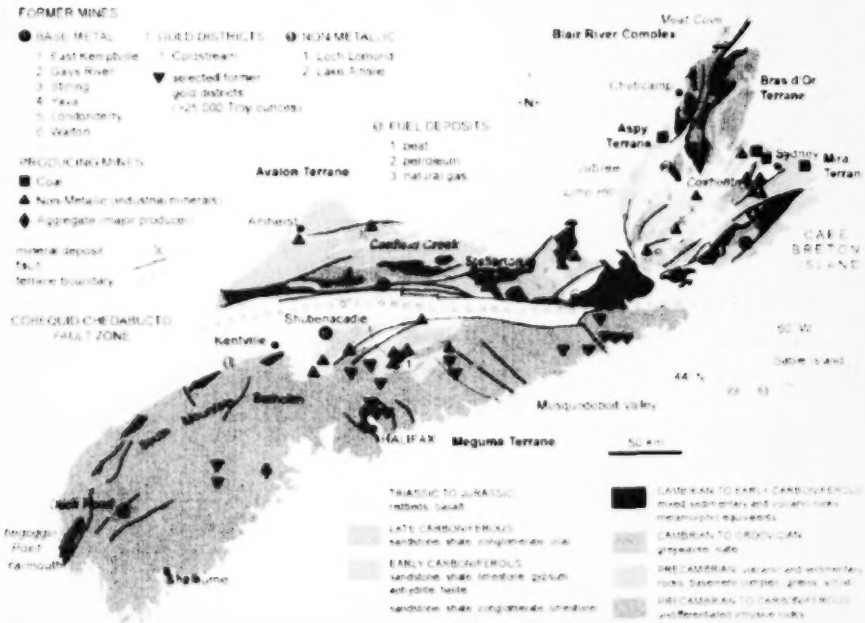
The Province of Nova Scotia features an amazing diversity of geological environments with a wide range of mineral and fuel deposits. We're worth exploring!

Geological History

The pre-Carboniferous geology of Nova Scotia is best considered in terms of two broad tracts, one to the north and one to the south of the Cobequid-Chedabucto Fault Zone (CCFZ). These two tracts developed independently prior to their juxtaposition during the mid-Devonian Acadian Orogeny (ca. 410-380 Ma).

Northern Nova Scotia:
Rocks north of the CCFZ have complex geological and metallogenic histories. The oldest rocks (ca. 1.4 Ga) are found in northwestern Cape Breton Island (Blair River Complex). They consist of metacarbonates and metasediments intruded by orthogneiss, charnockitic rocks, anorthosite, gabbro and syenite and are considered to be part of the Grenvillian margin of North America. In the central highlands region (Aspy Terrane) of Cape Breton Island, Late Ordovician to Silurian subduction-related metavolcanic and metasedimentary rocks were intruded by Silurian to Early Carboniferous granite. In central Cape Breton Island (Bras d'Or Terrane), Precambrian carbonate, quartzite and metagreywacke, thought to have formed at a continental margin, are intruded by subduction-related diorite, tonalite and granite. Rocks of eastern Cape Breton Island and northern mainland Nova Scotia (Mira and Avalon Terranes, respectively) comprise at least three successions of Late Precambrian volcanic and sedimentary rocks (ca. 680 Ma, 620 Ma, 575 Ma). These Precambrian rocks were deformed prior to the deposition of Early to Middle Cambrian strata and intruded by Late Precambrian to Early Cambrian diorite and granite.



Simplified geological map of Nova Scotia showing locations of selected mineral and fuel deposits, former mines and producing mines

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Southern Nova Scotia:
The southern half of Nova Scotia is a distinct, allochthonous fragment known as the Meguma Terrane. The oldest rocks in the Meguma Terrane comprise a flysch sequence of quartzite and slate assigned to the Cambrian to Ordovician Meguma Group. These rocks are nonconformably (or possibly tectonically) overlain by an interbedded sequence of Late Ordovician to Early Devonian marine sedimentary and volcaniclastic rocks and bimodal volcanic rocks. Great volumes of peraluminous granite and minor mafic dykes and plugs intruded the metamorphosed and folded rocks ca. 370 Ma.

Younger Rocks: On both sides of the CCFZ, fluvial and lacustrine rocks of the Early Carboniferous Horton Group, evaporitic, carbonate and siliciclastic rocks of the Early Carboniferous Windsor Group, and Late Carboniferous coal measures were deposited in a series of successor basins following the collision of southern and northern Nova Scotia. In many parts of the province, Early and Late Carboniferous strata unconformably overlie variably deformed metamorphic and intrusive rocks of Late Precambrian and Early Paleozoic age. Rift sediments and basalts were deposited across central Nova Scotia in an Early Mesozoic rift valley. Early Cretaceous deposits of kaolinitic clay and silica sand rest unconformably on older rocks in central Nova Scotia and Cape Breton Island.

Mineral Deposits
In Cape Breton Island, Precambrian carbonate rocks host important skarn deposits of zinc (Meat Cove, Lime Hill). Mafic and ultramafic intrusive rocks in northwestern Cape Breton Island also hold promise for magmatic Ni-Cu-Co deposits. Stratabound massive sulphide deposits are associated with metavolcanic and metasedimentary rocks near Cheticamp. High-grade auriferous quartz veins are hosted by sheared Precambrian para- and orthogneiss and diorite in the central Cape Breton Highlands (Aspy Terrane). The Stirling VMS Cu-Pb-Zn-Au deposit in eastern Cape Breton Island (Mira Terrane) is hosted by subduction-related volcanic rocks (ca. 680 Ma). A Late Precambrian (ca. 580 Ma) diorite pluton at Coxheath displays characteristic porphyry-style alteration and hosts a Cu-Mo-Au deposit.

Late Carboniferous coal measures underlie many parts of northern Nova Scotia and contain large reserves of bituminous coal.

The Cobequid-Chedabucto Fault Zone is host to many zoned ankerite and siderite vein systems with variable amounts of Cu±Fe±Co±Au±Ag±Ba (Londonderry, Copper Lake). Mineralization along the fault system occurred after the Early Carboniferous and before the Mesozoic.

In southern Nova Scotia, the Meguma Group hosts a variety of deposit types. Gold (±W±Sb±Ag) is found in veins, cross-cutting shear zones and saddle reefs. Disseminated gold has recently been found in quartzite and slate. Minerals in the veins yield ages of ca. 370 Ma, similar to the Devonian plutonic rocks in southern Nova Scotia. At the southern end of the South Mountain Batholith, vein and replacement zones in the Meguma Group host the Duck Pond Sn deposit and greisen zones in highly-evolved granitic rocks host the East Kemptville Sn-Zn-Cu-Ag deposit (ca. 370 Ma).

Several textural varieties of Meguma Terrane granite have been quarried for dimension stone. Glass-sand grade quartz deposits occur in White Rock Formation quartzite at Chegoggin Point. The Meguma Group also provides local, high quality sources of aggregate.

Erosion of the gold veins in Meguma Group rocks produced paleoplacer deposits (Witwatersrand type) in terrestrial sedimentary rocks of the Early Carboniferous Horton Group (Coldstream). The Windsor Group has large deposits of industrial minerals (gypsum, salt, dolomite, limestone and potash) and the carbonates are host to Mississippi Valley Type base metal±Ag±Ba deposits (Walton, Gays River, Jubilee). Windsor Group rocks also host large barite deposits (Walton, Lake Ainslie). A celestite deposit was mined from Horton Group rocks at Loch Lomond.

Late Carboniferous fluvial sandstones contain at least two important types of base metal deposit. Laisvall-type stratabound Pb deposits are found in quartz sandstones at Yava. Solution-front deposits in red and grey sandstones locally contain significant deposits of Cu-Ag±Zn ±Co±Au (Canfield Creek). Kupferschiefer-type shale-hosted Cu-Ag deposits are also related to red-grey solution boundaries in these rocks.

Early Cretaceous sediments outcrop along the edges of deep sedimentary basins, river banks and steep-walled valleys. These valuable deposits include glass-sand grade silica sand (Shubenacadie) and kaolinitic clay (Musquodoboit Valley).

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